

**U.S. FISH AND WILDLIFE SERVICE
SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM**

SCIENTIFIC NAME: Glyphopsyche sequatchie (Etnier and Hix)

COMMON NAME: Sequatchie caddisfly

LEAD REGION: 4

INFORMATION CURRENT AS OF: October 2005

STATUS/ACTION:

☐ Species assessment - determined species did not meet the definition of endangered or threatened under the Act and, therefore, was not elevated to Candidate status

☐ New candidate

☒ Continuing candidate

☐ Non-petitioned

☒ Petitioned - Date petition received: May 11, 2004

☐ 90-day positive - FR date:

☐ 12-month warranted but precluded - FR date:

☐ Did the petition request a reclassification of a listed species?

FOR PETITIONED CANDIDATE SPECIES:

a. Is listing warranted (if yes, see summary of threats below)? yes

b. To date, has publication of a proposal to list been precluded by other higher priority listing actions? yes

c. If the answer to a. and b. is "yes", provide an explanation of why the action is precluded. We find that the immediate issuance of a proposed rule and timely promulgation of a final rule for this species has been, for the preceding 12 months, and continues to be, precluded by higher priority listing actions (including candidate species with lower LPNs). During the past 12 months, almost our entire national listing budget has been consumed by work on various listing actions to comply with court orders and court-approved settlement agreements, meeting statutory deadlines for petition findings or listing determinations, emergency listing evaluations and determinations, and essential litigation-related, administrative, and program management tasks. We will continue to monitor the status of this species as new information becomes available. This review will determine if a change in status is warranted, including the need to make prompt use of emergency listing procedures. For information on listing actions taken over the past 12 months, see the discussion of "Progress on Revising the Lists," in the current CNOR which can be viewed on our Internet website (<http://endangered.fws.gov/>).

☐ Listing priority change

Former LP: ☐

New LP: ☐

Date when the species first became a Candidate (as currently defined): October 25, 1999

☐ Candidate removal: Former LP: ☐

- ☐ A – Taxon is more abundant or widespread than previously believed or not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status.
- ☐ U – Taxon not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status due, in part or totally, to conservation efforts that remove or reduce the threats to the species.
- ☐ F – Range is no longer a U.S. territory.
- ☐ I – Insufficient information exists on biological vulnerability and threats to support listing.
- ☐ M – Taxon mistakenly included in past notice of review.
- ☐ N – Taxon does not meet the Act's definition of "species."
- ☐ X – Taxon believed to be extinct.

ANIMAL/PLANT GROUP AND FAMILY: Insects – Limnephilidae

HISTORICAL STATES/TERRITORIES/COUNTRIES OF OCCURRENCE: Tennessee

CURRENT STATES/ COUNTIES/TERRITORIES/COUNTRIES OF OCCURRENCE: Marion County, Tennessee

LAND OWNERSHIP: One population is located on county-owned property and one population is on private property.

LEAD REGION CONTACT: Richard Gooch, 404/679-7124

LEAD FIELD OFFICE CONTACT: Cookeville, Tennessee, Field Office, Geoff Call, 931/528-6481, extension 213

BIOLOGICAL INFORMATION:

Description

Several characters combined are useful for diagnosing membership in the Trichopteran family Limnephilidae, including: consistent location of antenna about midway between eye and anterior edge of head capsule, with prosternal horn and chloride epithelia almost always present (Wiggins 1977). In Glyphopsyche sequatchie, the chloride epithelia is present on abdominal segments III-VIII (Etnier and Hix 1999). The extensive development of setae on abdominal segment I in many Limnephilidae is not common among other Trichopterans and nearly unique to the Nearctic caddisfly families (Wiggins 1977). The genus Glyphopsyche is among the few members of the Limnephilinae whose larvae in North America have dark-coloured bands on the legs, and contains the only such members with branched gills. Glyphopsyche larvae have stout setae on the lateral sclerite of the anal proleg and on the anterior edge of the pronotum (Wiggins 1977).

Etnier and Hix (1999) found adult male G. sequatchie separable from G. irrorata and G. missouri (the other two U.S. species in the genus, the former being boreal and the latter only known from

one spring in Missouri) on the basis of: 1) having two rather than three patches of black spinules on the posterior margin of the eighth abdominal tergite; 2) having an elongate projection on the inferior appendage of abdominal segment X; 3) having three pairs of elongate sclerotized dorsal and intermediate processes on segment X (versus 2 pairs of short processes); 4) having the length of the phallic parameres more than twice the diameter of the phallus; and 5) virtually lacking a partial crossvein between veins Sc and R1 at the cord versus with a crossvein extending from Rs more than halfway to Sc. Adult females, pupae, and larvae are also easily separable from these species.

Taxonomy

Etnier and Hix (1999) described G. sequatchie, which is a member of family Limnephilidae, subfamily Limnephilinae, tribe Chilostigmini (Wiggins 1977).

Habitat and Distribution

The Sequatchie caddisfly (Glyphopsyche sequatchie) is only known from two spring runs in Marion County, Tennessee - Owen Spring Branch (the type locality) and Martin Spring run in the Battle Creek system (Etnier and Hix, 1999). Both springs emerge from caves. The spring and spring run at Owen Spring Branch are within Sequatchie Cave Park, a small county park that extends to Old Highway 28, about 200 m (660 ft) below the cave entrance. The Sequatchie Cave Park was designated as a Class II Natural-Scientific State Natural Area on April 4, 2001, by then-Governor Don Sundquist. Owen Spring Branch averages about 12 meters (m) wide and 0.5 m deep and flows over a substrate of chert gravel, with silt and organic matter in the pool areas. About 15 m above Old Highway 28, a tributary of the Little Sequatchie River joins the spring run to form Owen Spring Branch. Another first order stream joins Owen Spring Branch before entering the Sequatchie River about 1.3 kilometers (km) below Owen Spring. The species occurs in the spring run from about 30 m below the entrance of the cave downstream to about 150 m below the highway, a reach of about 300 m. At this point, a handworks mill has dumped sawdust into the creek and larvae are difficult to find. No specimens were found in the Little Sequatchie tributary, where water temperatures are warmer (Etnier and Hix, 1999).

The Martin Spring site was discovered in May 1998 and is about 12 air miles west-northwest from the type locality. This spring also emerges from a cave and has about twice the width and discharge of Owen Spring. Though there appears to be twice as much suitable habitat, Glyphopsyche sequatchie were more difficult to find at this site.

Life History

While no studies of the life history of the Sequatchie caddisfly have been conducted, general caddisfly life history characteristics are summarized here from Wiggins (1977). Caddisflies at temperate latitudes typically complete one generation each year, consisting of five larval instars, a pupal stage, and a winged adult stage. The process from separation of the larval cuticle to emergence of the adult from the pupal skin typically occurs over about three weeks, though exceptions have been noted at the species level. Larvae of the subfamily Limnephilinae feed primarily on plant materials, reducing pieces of plant debris to small particles.

Etnier and Hix (1999) found G. sequatchie larval cases to be extremely variable, ranging from entirely vegetative material to entirely mineral material, though tending to have higher proportions of vegetation than in G. Missouri (Etnier and Hix 1999). Sequatchie caddisfly larvae were large enough to be identified by early June and were in final instar in early September, found in pools and gently flowing runs on dead limbs 5-10 cm in diameter with bark still attached (Etnier and Hix 1999). Other larvae were found on larger logs, with and without bark, and in wads of root hairs. Larvae were not found on rocks in the stream. Etnier and Hix (1999) reared final instar larvae collected on September 27 until they emerged on dates ranging from October 31 through February 4. They suspected that this pattern, which could have been an artifact of laboratory rearing, would be similar to emergence patterns expected under natural conditions.

Population Estimate

Based on an effort to census all Sequatchie caddisfly larvae in the approximately 300-m reach of Owen Spring Branch, Etnier and Hix (1999) estimated the population size for Owen Spring at 500 to 5000 individuals. They estimated the population could be 2 to 10 times larger at Martin Spring, due to the greater amount of apparently suitable habitat. More recently, Dr. David Etnier reported that the Sequatchie caddisfly was abundant at the type locality during observations in 2001, while only two individuals were observed at the Martin Spring locale (D. Etnier, University of Tennessee, personal communication, June 3, 2004).

THREATS:

A. The present or threatened destruction, modification, or curtailment of its habitat or range.

The Sequatchie caddisfly is known from only two spring runs in Marion County, Tennessee, and has never been found outside these areas. This extremely limited distribution, small population size, the limited amount of occupied habitat, the ease of accessibility, and the species' annual life cycle make the Sequatchie caddisfly extremely vulnerable to extirpation. Threats to the species include siltation; agricultural, municipal, and industrial runoff (both direct and from subsurface flows); vandalism; and pollution from trash thrown into the springs. Siltation could arise from off-road vehicle (ORV) use in the spring runs, adjacent banks, and at Owen Spring immediately upslope of the cave entrance, though guardrails have been installed at Owen Spring to limit this type of vandalism. If it occurred, timber harvesting on the Cumberland Plateau or its escarpment above the caves from which Owen or Martin springs emerge could also produce excessive siltation through surface and/or subsurface runoff. Pollution from trash thrown into the springs could contain harmful chemical residues. While agricultural, municipal, and industrial runoff do not pose imminent threats to the Sequatchie caddisfly, land use in the watersheds drained by Owen and Martin springs should be monitored for increasing threats of this nature. The Owen Spring population is currently receiving incidental legal protection, because the federally endangered royal snail (Pyrgulopsis ogmorhappe) also occupies this spring. The federally endangered pale liliput (Toxolasma cylindrellus) was collected from Owen Spring Branch in 1955, though its current status at the site is unknown. Martin Spring is on private land and receives no legal protection.

B. Overutilization for commercial, recreational, scientific, or educational purposes.

There is no indication that overutilization threatens the Sequatchie caddisfly. The specific areas inhabited by the Sequatchie caddisfly were not known to the scientific community until publication of the species description and, therefore, collecting has not been a significant threat. Collection from the Owen Spring Branch population requires a state-issued permit because it occurs within Sequatchie Cave Class II Natural-Scientific State Natural Area. The minimal collecting that has occurred for scientific purposes is not believed to pose a threat. However, the release of locality information could increase the threat from commercial collectors, especially if they perceive the species as rare and regulations limiting collecting. Etnier and Hix (1999) in their description of the species, urged the scientific community to treat this species as endangered because of its apparent vulnerability to extirpation due to its restricted distribution and small population sizes. The existence of this species and the specific areas it inhabits will likely not be widely known to the public until such time that a proposed rule to list the species is published. If the specific areas inhabited by this species are revealed, it would be easy for vandals to seriously impact or eliminate this species.

C. Disease or predation.

Although various predators undoubtedly consume the Sequatchie caddisfly, predation by naturally occurring predators is a normal aspect of the population dynamics of a species and is not considered a threat to this species. Introduced rainbow trout (*Oncorhynchus mykiss*) are present at the Martin Springs site and could pose a threat to the Sequatchie caddisfly. No diseases are known to be affecting the species.

D. The inadequacy of existing regulatory mechanisms.

Collection from the Owen Spring Branch population requires a state-issued permit because Owen Spring Branch is part of the Sequatchie Cave Class II Natural-Scientific State Natural Area. The Sequatchie caddisfly also receives incidental protection from threats to its habitat at this location, owing to the presence of the federally endangered royal snail. Federal listing would provide more stringent protection for this species by requiring collectors to obtain Federal endangered species permits to take this species, imposing greater penalties for unlawful collecting, and by requiring Federal agencies to consult with the Service when projects they fund, authorize, or carry out may adversely affect the species.

E. Other natural or manmade factors affecting its continued existence.

Because the Sequatchie caddisfly is presently restricted to two small spring runs, it would be vulnerable to extirpation from intentional or accidental toxic chemical spills, should they occur in the watersheds drained by Owen or Martin springs. Because the populations are physically isolated from each other, recolonization of any extirpated population would be unlikely without human intervention.

CONSERVATION MEASURES PLANNED OR IMPLEMENTED:

Owen Spring Branch flows from the mouth of Sequatchie Cave, which is part of an eight-acre, Class II Natural-Scientific State Natural Area (SNA) that was designated by the State of Tennessee in 2001. The Sequatchie Cave SNA is located within Sequatchie Cave Park, which is managed by the Marion County Highway Department (MCHD) on behalf of the Marion County Conservation Committee. The Tennessee Department of Environment and Conservation – Division of Natural Heritage (DNH) is currently preparing a management plan for this SNA, the draft of which identifies the Sequatchie caddisfly as one of six species targeted for conservation efforts (Brian Bowen, Tennessee Department of Environment and Conservation – Division of Natural Heritage, personal communication, June 7, 2004). In 1997, the Service awarded the DNH with a Partners for Fish and Wildlife Grant to perform habitat management and restoration activities for the royal snail at Owen Spring Branch (Tennessee Division of Natural Heritage, 2000). In 1998, wood waste deposited by the handleworks mill was removed from Owen Spring Branch. The waste from the mill is now collected as fuel for the facility's boiler rather than being deposited streamside. Also in 1998, Tennessee Fur Harvesters Association volunteers trapped several beavers from Owen Spring Branch, and the DNH subsequently removed a beaver dam that winter. These efforts are reported to have improved flow conditions in the spring run. Working with the MCHD, the Tennessee Department of Transportation, Sequatchie Concrete, and local volunteers, the DNH installed a guardrail/cable fence to prevent off-road vehicle access to Owen Spring Branch in 1999 and stabilized eroding banks caused by previous ORV use of the site. In 2000, DNH and MCHD began removing exotic vegetation along Owen Spring Branch in an effort to restore native riparian vegetation and desirable thermal conditions to the spring run. Also in 2000, these agencies installed water bars, berms, and straw bales to abate erosion of a retired logging road that had become a source of sediment pulses into Owen Spring Branch following storm events. The Sequatchie community supports restoration efforts at Owen Spring Branch, as evidenced by local volunteer leadership in planning and participation in onsite activities.

SUMMARY OF THREATS :

The primary threats to Sequatchie caddisfly include its extremely limited distribution, apparent small population size, the limited amount of occupied habitat, the ease of accessibility, and the species' annual life cycle. All of these factors leave the Sequatchie caddisfly extremely vulnerable to extirpation.

For species that are being removed from candidate status:

___ Is the removal based in whole or in part on one or more individual conservation efforts that you determined met the standards in the Policy for Evaluation of Conservation Efforts When Making Listing Decisions (PECE)?

RECOMMENDED CONSERVATION MEASURES:

LISTING PRIORITY:

THREAT		

Magnitude	Immediacy	Taxonomy	Priority
High	Imminent	Monotypic genus	1
		Species	2
		Subspecies/population	3
	Non-imminent	Monotypic genus	4
		Species	5*
		Subspecies/population	6
Moderate to Low	Imminent	Monotypic genus	7
		Species	8
		Subspecies/population	9
	Non-imminent	Monotypic genus	10
		Species	11
		Subspecies/population	12

Rationale for listing priority number:

Magnitude: This species is known from only two easily accessible spring runs in Tennessee. Because the Sequatchie caddisfly occurs in limited numbers in these two spring runs, it is vulnerable to local extirpation or perhaps even rangewide extinction due to both random, catastrophic environmental (or human-induced) events and/or gradual changes in human land use patterns over time.

Imminence: These threats are gradual and/or not necessarily imminent, but are of a high magnitude.

Yes Have you promptly reviewed all of the information received regarding the species for the purpose of determining whether emergency listing is needed?

Is Emergency Listing Warranted? No, we believe that emergency listing is not warranted at this time for the Sequatchie caddisfly. The species was abundant at Owen Spring Branch in 2001, and this site enjoys protection as a Class II Natural-Scientific State Natural Area (SNA) since its designation as such by the State of Tennessee in 2001. Incidental protection under the Endangered Species Act is also afforded this population due to the presence of the endangered royal snail in Owen Spring Branch. The Martin Spring site is located on private land and, because only two Sequatchie caddisflies were observed during an informal visit to this site by Etnier in 2001, we believe that a current survey of this and Owen Spring Branch is needed to evaluate the species current status. We also believe that alternative conservation strategies, such as attempting to establish a cooperative management agreement with the Martin Spring landowner, should be pursued as a means of removing potential anthropogenic threats to this species on private land rather than initiating listing under the Endangered Species Act at this time.

DESCRIPTION OF MONITORING:

Sequatchie caddisfly (*Glyphopsyche sequatchie*) Candidate Form October 2005

Monitoring for the Sequatchie caddisfly has consisted of periodic, informal site visits by species experts. Dr. David Etnier reported that the Sequatchie caddisfly was abundant at the type locality during observations in 2001, while only two individuals were observed at the Martin Spring locale (D. Etnier, University of Tennessee, personal communication, June 3, 2004). The Service contacts species experts and biologists with State agencies annually to solicit information regarding either monitoring activities conducted for this species or management activities that could affect its status in the two locations from which it is known. The Service also maintains contact with the landowner at the Martin Spring Run locality in order to learn of any disturbances or potential land use changes in close proximity to the site. While this level of monitoring provides limited information for updating this assessment of the status of the Sequatchie caddisfly, regularly scheduled monitoring would strengthen the data on which these assessments are based.

COORDINATION WITH STATES:

Indicate which State(s) (within the range of the species) provided information or comments on the species or latest species assessment: none

Indicate which State(s) did not provide any information or comments: Tennessee

LITERATURE CITED:

Peer reviewed original research based on data

Etnier, D. A., and R. L. Hix. 1999. A new Glyphopsyche Banks (Trichoptera: Limnephilidae) from southeastern Tennessee. Proc. Ent. Soc. Washington 101:624-630.

Peer reviewed secondary research derived

Wiggins, G. B. 1977. Larvae of the North American Caddisfly Genera (Trichoptera). University of Toronto Press, Buffalo, New York. 401 pp.

Grey research based on data

Etnier, D. A. 1997. Status of Ceratopsyche etnieri, Glyphopsyche missouri, Hydroptila decia, and Lepidostoma etnieri (Insecta: Trichoptera). Report submitted to the U. S. Fish and Wildlife Service Office of Endangered Species, Asheville, North Carolina, and the Tennessee Wildlife Resources Agency, Nashville. 7 pp.

Gordon, M. 1991. Survey of the aquatic mollusca of the Sequatchie River and Battle Creek drainages. Report submitted to the U. S. Fish and Wildlife Service Office of Endangered Species, Asheville, North Carolina, and the Tennessee Wildlife Resources Agency, Nashville. 21 pp.

Tennessee Division of Natural Heritage. 2000. Conservation and enhancement of two populations of the royal snail (Pyrgulopsis ogmorhappe) in Jasper and Sequatchie, Marion County, Tennessee. Report submitted to the U. S. Fish and Wildlife Service, Asheville, North Carolina. 23 pp.

APPROVAL/CONCURRENCE: Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes, including elevations or removals from candidate status and listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all resubmitted 12-month petition findings, additions or removal of species from candidate status, and listing priority changes.

Approve: /s/ Jeffrey M. Fleming 11/16/2005
Acting Regional Director, Fish and Wildlife Service Date



Concur: _____ August 23, 2006
Acting Director, Fish and Wildlife Service Date

Do Not Concur: _____
Director, Fish and Wildlife Service Date

Date of annual review: October 2005

Conducted by: Cookeville, Tennessee Field Office